

CIMS: Canal Irrigation Management System



“If irrigation managers at various levels are provided with IT tools for taking appropriate decisions, reservoir operations and management can take a quantum leap forward”

The product

CIMS: Canal Irrigation Management System

A comprehensive canal management and control system

The client

Canal Controls and Communication Pilot Project, Khadakwasla, Pune

A body which manages the irrigation systems of the Khadakwasla dam, near Pune

The Khadakwasla irrigation scheme comprises three dams — the Panshet dam (on the Ambi river), the Warasgaon dam (on the Mose river) and the Khadakwasla dam (on the Mutha river). The first two, being upstream dams, are used for power generation and for feeding the downstream Khadakwasla dam, which is used for irrigation, municipal and industrial water supply. The main canal — the new Mutha right bank canal (NMRBC) — is a 202 km-long contour canal, serving a gross command area of about 97,100 hectares.

Details

The concept behind the canal controls and communication project, phases I and II, at the Khadakwasla irrigation scheme, was to develop a comprehensive canal management system (including a control system) for selected hydraulic structures on the main canal. It is integrated with the decision support system and the telemetry system implemented in phase I of the project. The improved canal management system aims for better management of available water resources for irrigation

Objectives

The project aimed to test the applicability of IT solutions in optimising the use of water resources and improving the operational efficiencies of the canal system. The objective of phase II was enhancement of the system developed in phase I, through enhanced monitoring, decision support systems (DSS) and control.

Scope

Phase I comprised the design, development and installation of:

- A telemetry system for acquisition, storage and transmission of real-time data from

- remote locations (storage and transmission)
- A computer-based decision support system for effective reservoir operation and canal operation, incorporating rule-curve based reservoir operation, seasonal irrigation planning, scheduling distributary operations, flow simulation and monitoring
- A database management system for maintaining the master data and operational data of the system

Phase II involved:

- Development of a comprehensive canal management system including a gate control system for selective control of hydraulic structures on the main canal
- Design and development of a centralised decision support system coupled with the telemetry and control system
- Integration of the system implemented in phase I with the phase II system, to enhance the decision support system and effectively operate the reservoirs and canal systems as planned

IT-based system

The IT-based system implemented in phase I consists of two sub-systems - a telemetry system and an irrigation management system. The former acquires real-time hydro-meteorological data from various remote terminal units (RTUs) through a VHF communication network. Constructing rule curves for the reservoir at various dependability levels, based on historical data, enables operation and monitoring of the reservoirs.

The system prepares seasonal preliminary irrigation programmes (PIP), to estimate the irrigation requirements under different distributaries / minors / outlets, apart from estimating weekly crop water requirements. It also schedules off-take, using optimisation techniques to minimise operational losses. Assuming a steady state flow, the system calculates water levels and flows at identified locations, control structures and off-take gate settings, and monitors canal flows. In addition, the system maintains configuration data, as well as promptly generates management reports.

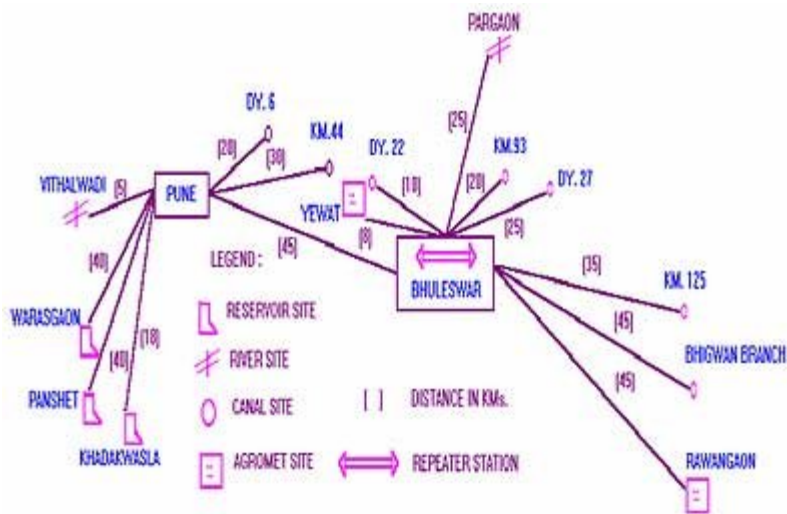
The enhanced system in phase II extends the scheduling of the main canal to branch / distributary level. Flow simulations are generated for both steady state and unsteady state flow conditions. An automatic gate control system has been implemented at identified cross-regulators and the head-regulator. System management is extended to the sub-divisional and sectional levels. The system also provides information about the revenue aspects of the project.

Telemetry system: Phase I

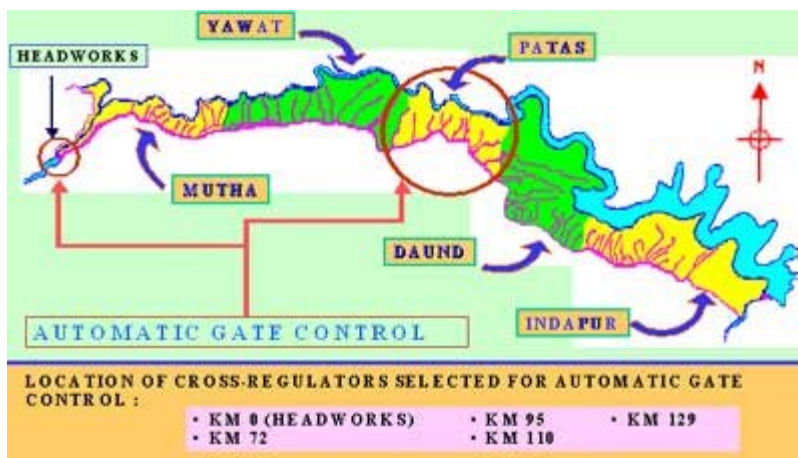
The telemetry system acquires real-time canal level data, reservoir level data and hydro-

meteorological data from various remote stations across a command area of 90,000 hectares, through a VHF communication network.

Length of canal	201 km
Number of control structures	5
Number of remote stations for telemetry	
Canal water level	8
Reservoir water level	3
River gauging	2
Agro-met stations	2
Rainfall monitoring stations	2



Geographical Distribution of Telemetry Sites in Phase I



Telemetry system: Phase II

Includes centralised control of selected cross-regulators on the canal from the central control station. The system collects real-time data about the command area climate, river and canal flow from selected remote locations and reservoir level data at a user-defined time interval. The decision support system is coupled with automated control of selected control structures, for an identified sub-command.

Length of canal	201 km
Number of control structures	5
Number of remote stations for telemetry	
Cross-regulator control sites	4
Head-regulator control sites	1